

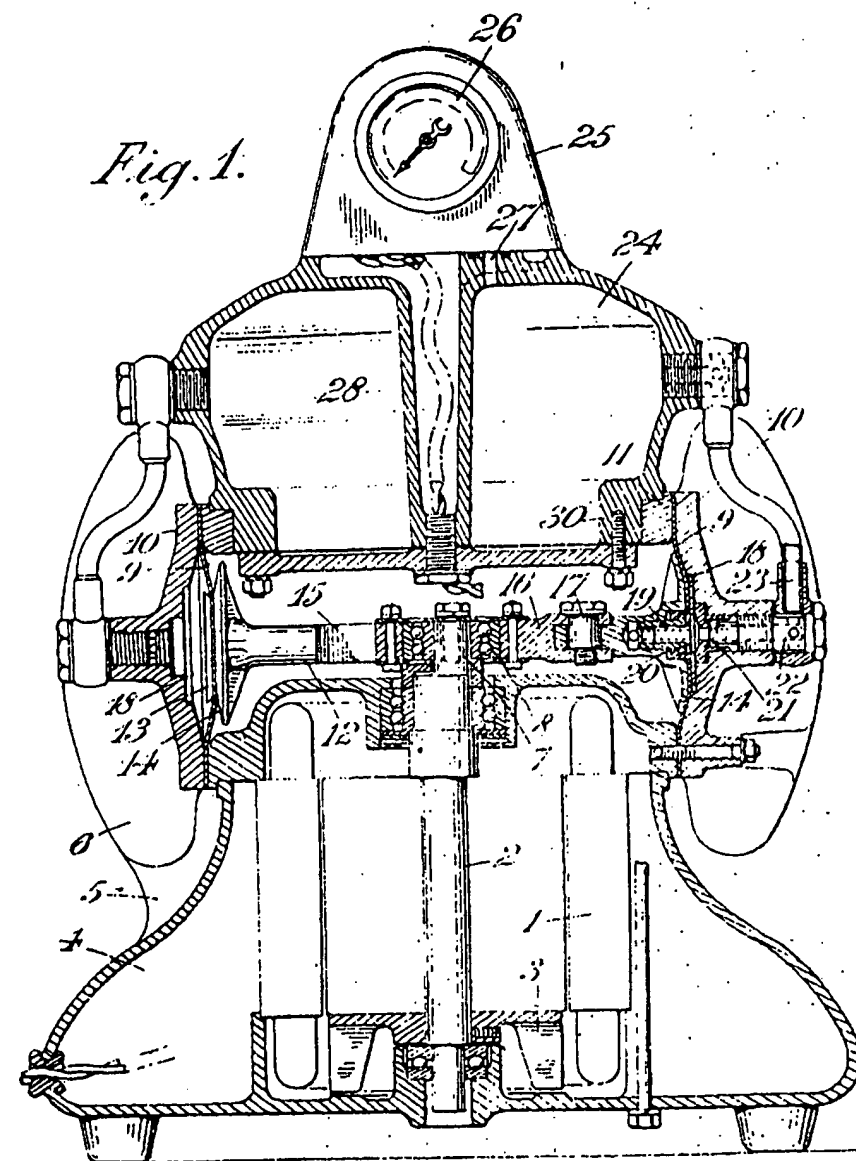
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JAN 1949SPECIFICATION N° 20674<sup>45</sup>2 SHEETS  
SHEET 1

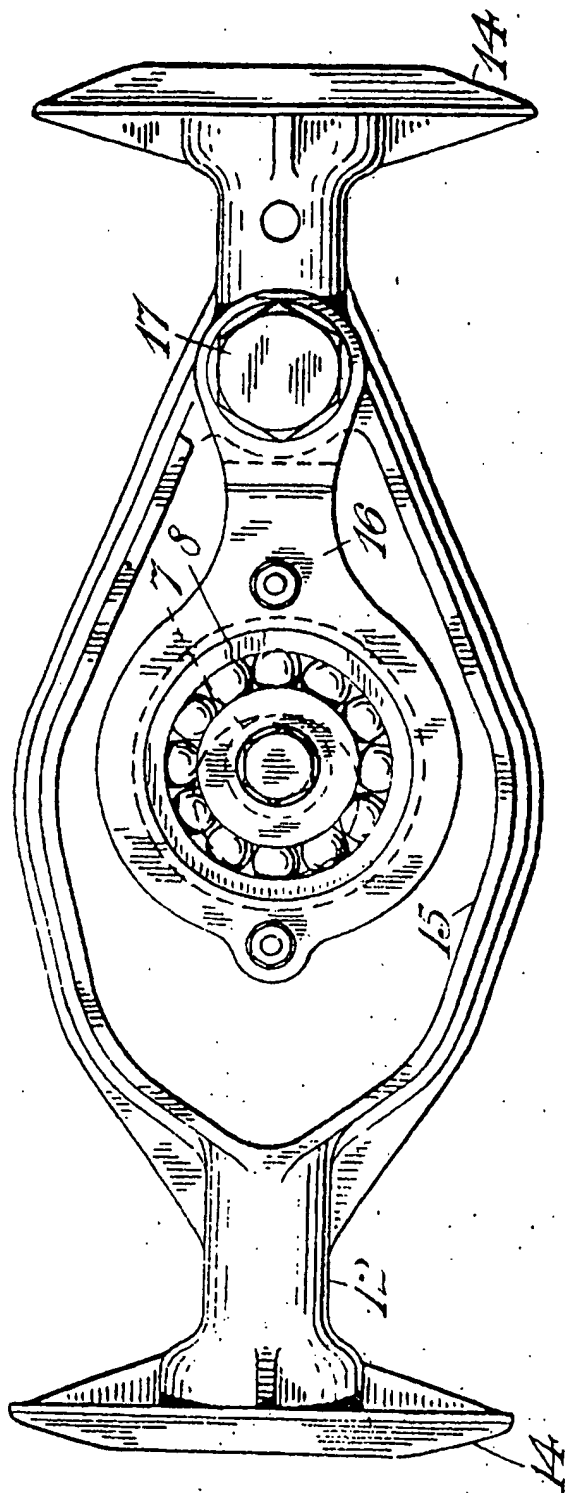
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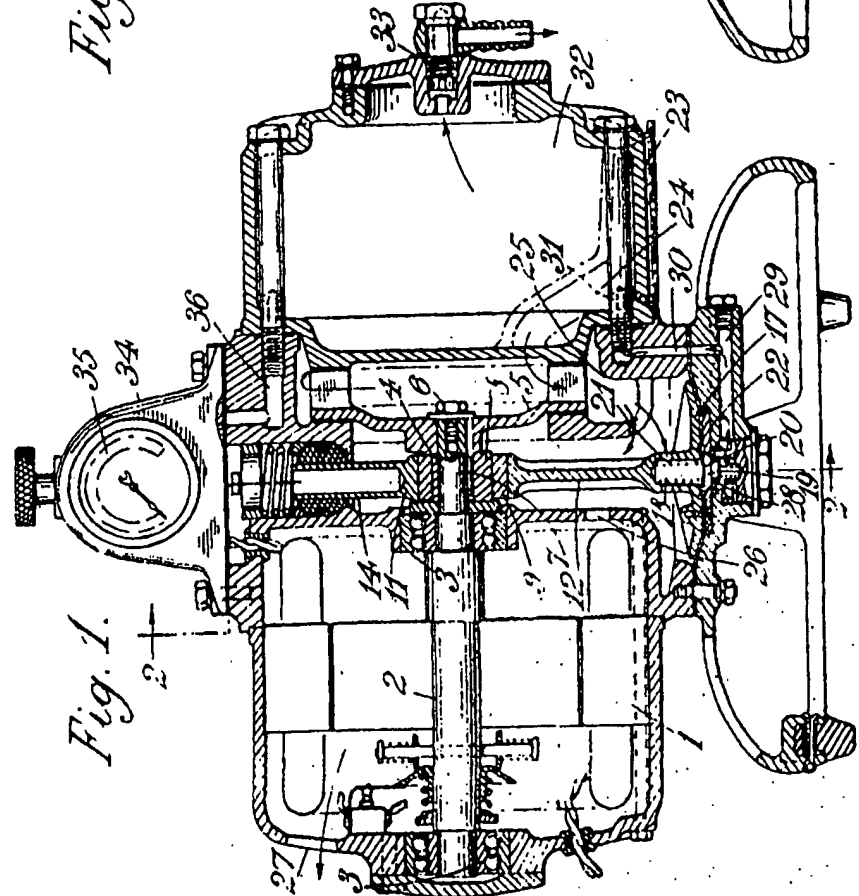
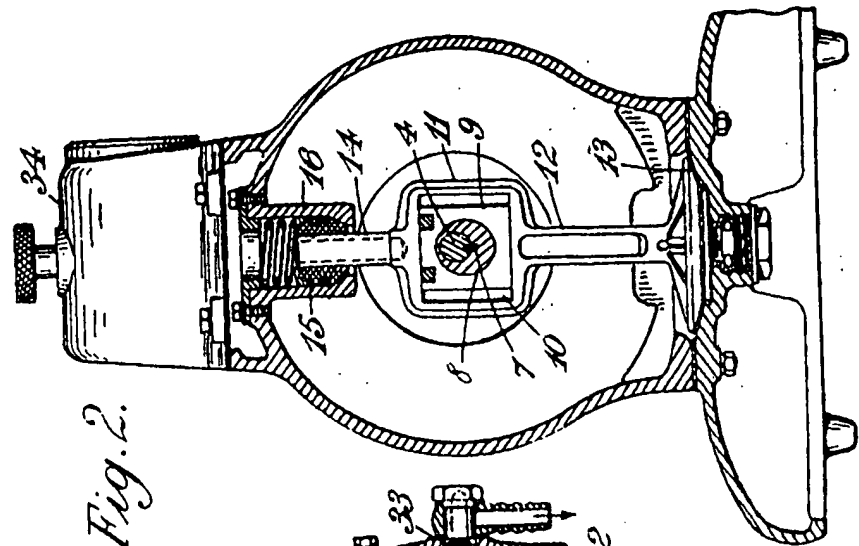
H. M. S. O. (L. P.)

*[This Drawing is a reproduction of the Original on a reduced scale.]*

*Fig. 2.*



[This Drawing is a reproduction of the Original on a reduced scale.]



H.M.S.O. (Iy.P.)

## PATENT SPECIFICATION

616,173



Application Date: May 6, 1946.

No. 13701/46.

" " July 10, 1946.

No. 20674/46.

One Complete Specification left (under Section 16 of the Patents and Designs Acts, 1907 to 1946): May 5, 1947.

Specification Accepted: Jan. 18, 1949.

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Index at acceptance:—Classes 8(i), C1c2, C2a4(a: b), C2i; and 110(i), C4c2.

## PROVISIONAL SPECIFICATION

No. 13701 A.D. 1946.

## An Improved Diaphragm Type Compressor

We, SELF-PRIMING PUMP & ENGINEERING Co. LIMITED, a British Company, of Parliament Mansions, Victoria Street, London, S.W.1, GASKELL & CHAMBERS LIMITED, a British Company, of 52, Dale End, Birmingham, 4, JOHN ERNEST NEVILLE YATES, a British Subject, of 41, Yateley Road, Edgbaston, Birmingham, ARTHUR LIONEL BROWN DAWSON, and GEORGE CHARLES MEREDREW, both British subjects, and both of Parliament Mansions, Victoria Street, London, S.W.1, do hereby declare the nature of this invention to be as follows:—

15 This invention relates to compressors of the diaphragm type and has for an object the provision of an improved compressor of that type. In diaphragm compressors as normally constructed a flexible diaphragm forming a wall or part of a wall of a compression chamber is given a reciprocatory flexing movement to induce a charge of air or other gas into the compression chamber and then to compress the air and force it out of the chamber under pressure. The reciprocatory movement is usually given to the diaphragm by means of a rotating crank or eccentric connected to the diaphragm by a rod or, in some instances, by a piston operating in a cylindrical guide.

In the compressor according to the present invention the diaphragm is operated by a rod which is connected at one end to the diaphragm, is slidable in a self-aligning guide bearing at the other end and is given a reciprocatory motion by means of a crank pin or eccentric engaging a slotted yoke provided in the rod intermediate in the length of the rod between the guide and the diaphragm. This arrangement has the advantage that the minimum of side-thrust is applied to the diaphragm without constraining the movements of the diaphragm.

In the preferred form of the invention a block is provided in the slotted yoke and

[Price 2/-]

is slidable therein laterally of the rod and the crank pin or eccentric engages a hole in the block.

A compressor embodying the above and further features of the invention will now be described with reference to the accompanying drawings in which:—

Figure 1 is a longitudinal section 55 through the compressor and

Figure 2 is transverse section on the line 2—2 in figure 1.

The compressor, in this embodiment, is constructed as a unit with an alternating 60 current electric motor 1 suitable for common mains supply of which the shaft 2 is supported in bearings 3 and has an extension 4 carrying a centrifugal fan 5 secured to the shaft by a nut 6 and key 7. 65 The boss 8 of the fan is eccentric in relation to the shaft extension 4 and constitutes the operating means for the diaphragm.

The eccentric boss 8 runs in a self-lubricating block 9 which is laterally slidable in a slot 10 provided on a yoke 11 in the operating rod 12 for the diaphragm 13. The end 14 of the rod 12 remote from the diaphragm is slidable in a self-aligning 75 spherical bearing 15 of the self-lubricating type known under the registered trade mark "Oilite" and held in a guidehousing 16. The arrangement may be such that the rod slides through the bearing 15 80 or the rod and the bearing may slide in the guide housing 16.

The lower end of the rod 12 is enlarged to provide a head 17 for applying pressure to the diaphragm and is provided with a 85 passageway 18 leading to the compression chamber 19 past an inlet valve 20 which is provided with a spring 21 tending to prevent operation of the valve until the motor is running at or near its normal 90 operating speed. A plate 22 attached by screws to the head 17 clamps the diaphragm against the head and also serves as a retainer for the inlet valve-disc.

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The fan 5 is arranged to draw air through an inlet filter 23 and inlet passageway 24 and to deliver the air through a volute chamber 25 leading to the passageway 18 and also through holes 26 so that part of the air is fed to the compression chamber and the remainder to the motor where it serves to cool the motor and eventually leaves the motor through holes 27.

The compressed air leaves the compression chamber through a valve 28 and passageways 29, 30, 31 and is fed into a reservoir chamber 32 having an outlet connection 33. The connection 33 is located well above the bottom of the chamber in order to reduce any tendency for moisture collected in the chamber to pass out with the air. A drain may be provided in the bottom of the chamber if desired.

Mounted on top of the compressor is an automatic pressure control unit 34 comprising a mercury cut-out switch operable automatically to stop the motor when a predetermined, adjustable pressure has been reached in the reservoir chamber.

and a pressure gauge 35. A passageway 36 serves to convey the pressure to the diaphragm for operating the switch.

The unit described above may, if desired, be used in conjunction with an additional reservoir chamber and it may be mounted on top of the additional chamber.

The compressor has many practical uses, for example it may be used for supplying pressure to beer in a pressure operated beer dispensing system or it may be used to supply substantially moisture free compressed air for spraying paint. The compressor may be made in a metal or alloy suited for the purpose for which it is required. Iron or an aluminium alloy are convenient materials suitable for most purposes. The motor may be arranged for direct current operation if required.

Dated this 6th day of May, 1946.  
BOULT, WADE & TENNANT,  
111 & 112, Hatton Garden, London,  
E.C.1,  
Chartered Patent Agents.

#### PROVISIONAL SPECIFICATION No. 20674 A.D. 1946.

#### An Improved Diaphragm Type Compressor

We, SELF-PRIMING PUMP & ENGINEERING COMPANY LIMITED, a British Company, of Parliament Mansions, Victoria Street, London, S.W.1, GASKELL & CHAMBERS LIMITED, a British Company, of 52, Dale End, Birmingham, 4, JOHN ERNEST NEVILLE YATES, a British Subject, of the Drive, 62, Wellington Road, Edgbaston, Birmingham, ARTHUR LIONEL BROWN DAWSON and GEORGE CHARLES MEREDREW, both British Subjects, and both of Parliament Mansions, Victoria Street, London, S.W.1, do hereby declare the nature of this invention to be as follows:—

The invention relates to compressors of the diaphragm type and has for an object the provision of an improved compressor of that type. In diaphragm compressors a flexible diaphragm forming a wall or part of a wall of a compression chamber is given a reciprocatory flexing movement to induce a charge of air or other gas into the compression chamber and then to compress the air and force it out of the chamber under pressure. The reciprocatory movement is usually given to the diaphragm by means of a rotated crank or eccentric connected to the diaphragm by a rod, or, in some instances, by a piston operating in a cylindrical guide.

The present invention provides a diaphragm compressor having two compression chambers and diaphragms and a rod or the equivalent connecting the two diaphragms and arranged for reciprocatory motion to operate the diaphragms. Preferably the common operating rod is given substantially rectilinear motion. A compressor constructed in this way has a more regular output than one having a single operating diaphragm and the arrangement may be such that the minimum of side thrust is applied to the diaphragms without constraining the movements of the diaphragms.

The reciprocatory motion may be imparted to the common operating rod through a connecting rod pivoted to the operating rod and to a rotatable eccentric or crank. Conveniently the axis of rotation of the eccentric or crank passes through or is closely adjacent to the axis of the rod and is perpendicular thereto. In a practical form of this last-mentioned feature of the invention, the crank or eccentric and the connecting rod are located within an enlarged slot or yoke formed in the operating rod.

A compressor embodying the above and further features of the invention will now be described with reference to the accom-

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panying drawings in which:—

Figure 1 is a longitudinal section through the compressor and driving motor, and

5 Figure 2 is a plan view of the operating rod for the two diaphragms and the means for imparting reciprocatory movements to the rod.

The compressor, in this embodiment, is  
10 constructed as a unit with an alternating current electric motor 1 suitable for the normal mains supply. The motor shaft 2 carries at its lower end a fan 3 which circulates air upwardly through the motor  
15 and then downwardly around the outside of the motor into a chamber 4 from which the air leaves in the upwards direction through passageways 5. The air as it leaves the passageways 5 passes over ribs  
20 6 formed on the compression chambers of the pump and serves to maintain a circulation of air over the pump chambers to assist in the cooling of them. At its upper end, the motor shaft 2 is formed  
25 with an eccentric pin 7 surrounded by a ball-bearing 8 and forming the operating means for the compressor.

The compressor comprises two diaphragms 9 clamped at their edges by cover  
30 plates 10 co-operating with flanges 11 on the compressor casing which is of generally circular form in plan view and conforms with the top of the chamber 4. The diaphragms are reciprocated by means of  
35 a rod 12 extending between the two diaphragms and attached thereto by screws passing through plates 13 and engaging enlarged heads 14 on the ends of the rod. Intermediate in the length of the rod  
40 there is formed a yoke 15 surrounding the ball-bearing 8. A connecting rod 16 is pivoted to the rod 12 at 17 and embraces the outer face of the ball-bearing 8. Rotation of the eccentric 7 accordingly  
45 causes a reciprocatory movement of the rod 12 transmitted to the rod by the connecting rod 16. It is to be noted that the rod 12 is supported at both ends by the

diaphragms which ensure that the motion of the rod is substantially rectilinear and 50 that there is very little side-thrust applied to the rod.

Air is admitted to the compression chambers 18 through passageways 19  
55 formed in the rod 12 and inlet valves 20. The air is drawn through an inlet filter not shown in the drawings. The air is discharged from the compression chambers through outlet valves 21 and passageways 22, 23 leading to a storage reservoir  
60 24 fitting into the top of the compressor casing 11 and secured by side fixing set screws. The reservoir is provided with a suitable air outlet valve which also embodies an overload safety relief valve, 65 and at the bottom of the reservoir there is a drain cock through which any water accumulating in the reservoir may be removed. The reservoir has a spigot 30  
70 fitting inside a peripheral flange on the pump casing and is secured by four screws passing through the flange into the spigot.

Mounted on top of the reservoir 24 is an automatic pressure control unit 25 comprising a mercury cut-out switch operable  
75 automatically to stop the motor when a pre-determined adjustable pressure has been reached in the reservoir chamber. The unit includes a pressure gauge 26 and a passageway 27 to convey the pressure in  
80 the reservoir to the gauge and to a diaphragm for operating the cut-out switch. The electrical connections between the switch and the motor are led through a passageway 28 provided in the reservoir  
85 24.

The unit described above may, if desired, be used in conjunction with an additional reservoir chamber and it may be mounted on top of the additional chamber.  
90

Dated this 10th day of July, 1946.

BOULT, WADE & TENNANT,

111 & 112, Hatton Garden, London,

E.C.1.

Chartered Patent Agents.

## COMPLETE SPECIFICATION

### An Improved Diaphragm Type Compressor

We, SELF-PRIMING PUMP & ENGINEERING COMPANY LIMITED, a British Company, of Parliament Mansions, Victoria Street, London, S.W.1, GASKELL &  
95 CHAMBERS LIMITED, a British Company, of 52, Dale End, Birmingham, 4, JOHN ERNEST NEVILLE YATES, a British Subject, of The Drive, 62, Wellington Road, Edgbaston, Birmingham, (formerly of  
10041, Yately Road, Edgbaston Birmingham). ARTHUR LIONEL BROWN DAWSON

and GEORGE CHARLES MEREDREW, both British Subjects, and both of Parliament Mansions, Victoria Street, London, S.W.1, do hereby declare the nature of this invention and in what manner the  
105 same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to compressors of the diaphragm type and has for an object 110 the provision of an improved compressor

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of that type. In diaphragm compressors a flexible diaphragm forming a wall or part of a wall of a compression chamber is given a reciprocatory flexing movement to induce a charge of air or other gas into the compression chamber and then to compress the air and force it out of the chamber under pressure. The reciprocatory movement is usually given to the diaphragm by means of a rotating crank or eccentric connected to the diaphragm by a rod or, in some instances by a piston operating in a cylindrical guide.

According to the present invention a diaphragm compressor is characterised by the feature that the diaphragm is operated by a rod which is connected at one end to the diaphragm, is constrained for substantially rectilinear movement at that end solely by the diaphragm, is constrained for substantially rectilinear movement at the other end and is reciprocated by a crank pin, eccentric, cam or the equivalent intermediate in the length of the rod. This arrangement, which is contrasted with proposals in which the rod is supported in rigid guides adjacent to the diaphragm, has the advantage that the minimum of side-thrust is applied to the diaphragm without constraining the movements of the diaphragm.

In one form of the invention the aforesaid other end of the rod is guided in a self-aligning guide bearing.

In a second form of the invention the aforesaid other end of the rod is attached to and effects the operation of, a second diaphragm which constrains the movements of the rod as aforesaid. The second diaphragm conveniently constitutes the operating diaphragm of a second compression chamber.

The crank pin eccentric or equivalent is, in practice, positioned on or near the axis of the rod (e.g. is received within a yoke formed in the rod) and transmits motion to the rod either by means of a connecting rod or by means of a block surrounding the crank pin or eccentric and slidable laterally with respect to the rod in guides formed in the rod.

The weight of the rod may be supported by the eccentric.

Two compressors according to the invention will now be described, by way of example, with reference to the drawings accompanying the provisional specifications.

In the drawings accompanying provisional specification No. 13701/46:—

Figure 1 is a longitudinal section through one of the compressors and

Figure 2 is a transverse section on the line 2—2 in Figure 1.

In the drawings accompanying pro-

visional specification No. 20674/46:—

Figure 1 is a longitudinal section through the other compressor and driving motor, and

Figure 2 is a plan view of the operating rod for the two diaphragms and the means for imparting reciprocatory movements to the rod in the compressor shown in Figure 1.

The compressor, in the embodiment shown in the drawings accompanying provisional specification No. 13701/46 is constructed as a unit with an alternating current electric motor 1 suitable for common mains supply of which the shaft 2 is supported in bearings 3 and has an extension 4 carrying a centrifugal fan 5 secured to the shaft by a nut 6 and key 7. The boss 8 of the fan is eccentric in relation to the shaft extension 4 and constitutes the operating means for the diaphragm.

The eccentric boss 8 runs in a self-lubricating block 9 which is laterally slidable in a slot 10 provided in a yoke 11 in the operating rod 12 for the diaphragm 13. The end 14 of the rod 12 remote from the diaphragm is slidable in a self-aligning spherical bearing 15 of the self-lubricating type known under the registered trade mark "Oilite" and held in a guidehousing 16. The arrangement may be such that the rod slides through the bearing 15 or the rod and the bearing may slide in the guide housing 16.

The lower end of the rod 12 is enlarged to provide a head 17 for applying pressure to the diaphragm and is provided with a passageway 18 leading to the compression chamber 19 past an inlet valve 20 which is provided with a spring 21 tending to prevent operation of the valve until the motor is running at or near its normal operating speed. A plate 22 attached by screws to the head 17 clamps the diaphragm against the head and also serves as a retainer for the inlet valve disc. The diaphragm constrains the lower end of the rod for rectilinear movement.

The fan 5 is arranged to draw air through an inlet filter 23 and inlet passageway 24 and to deliver the air through a volute chamber 25 leading to the passageway 18 and also through holes 26 so that part of the air is fed to the compression chamber and the remainder to the motor where it serves to cool the motor and eventually leaves the motor through holes 27.

The compressed air leaves the compression chamber through a valve 28 and passageways 29, 30, 31 and is fed into a reservoir chamber 32 having an outlet connection 33. The connection 33 is

located well above the bottom of the chamber in order to reduce any tendency for moisture collected in the chamber to pass out with the air. A drain may be provided in the bottom of the chamber if desired.

Mounted on top of the compressor is an automatic pressure control unit 34 comprising a mercury cut-out switch operable automatically to stop the motor when a predetermined adjustable pressure has been reached in the reservoir chamber, and a pressure gauge 35. A passageway 36 serves to convey the pressure to the diaphragm for operating the switch.

The unit described above may, if desired, be used in conjunction with an additional reservoir chamber and it may be mounted on top of the additional chamber.

The compressor has many practical uses, for example it may be used for supplying pressure to beer in a pressure operated beer dispensing system or it may be used to supply substantially moisture free compressed air for spraying paint. The compressor may be made in a metal or alloy suited for the purpose for which it is required. Iron or an aluminium alloy are convenient materials suitable for most purposes. The motor may be arranged for direct current operation if required.

Modification may be made in the above example if desired. For instance, the operating rod may be of tubular form and be provided with a screwed insert constituting the seating for the inlet valve and leading into the tube which is provided with air inlet apertures in its walls. Again the holes 26 may be enlarged to form a single passageway of substantial area leading to the motor.

The compressor, in the embodiment shown in the drawings accompanying provisional specification No. 20674/46 is constructed as a unit with an alternating current electric motor 1 suitable for the normal mains supply. The motor shaft 2 carries at its lower end a fan 3 which circulates air upwardly through the motor and then downwardly around the outside of the motor into a chamber 4 from which the air leaves in the upwards direction through passageways 5. The air as it leaves the passageways 5 passes over ribs 6 formed on the compression chambers of the pump and serves to maintain a circulation of air over the pump chambers to assist in the cooling of them. At its upper end, the motor shaft 2 is formed with an eccentric pin 7 surrounded by a ball-bearing 8 and forming the operating means for the compressor.

The compressor comprises two dia-

phragms 9 clamped at their edges by cover plates 10 co-operating with flanges 11 on the compressor casing which is of generally circular form in plan view and conforms with the top of the chamber 4. The diaphragms are reciprocated by means of a rod 12 extending between the two diaphragms and attached thereto by screws passing through plates 13 and engaging enlarged heads 14 on the ends of the rod. Intermediate in the length of the rod there is formed a yoke 15 surrounding the ball-bearing 8. A connecting rod 16 is pivoted to the rod 12 at 17 and embraces the outer face of the ball-bearing 8. Rotation of the eccentric 7 accordingly causes a reciprocatory movement of the rod 12 transmitted to the rod by the connecting rod 16. It is to be noted that the rod 12 is supported at both ends by the diaphragms which ensure that the motion of the rod is substantially rectilinear and that there is very little side-thrust applied to the rod.

Air is admitted to the compression chambers 18 through passageways 19 formed in the rod 12 and inlet valves 20. The air is drawn through an inlet filter not shown in the drawings. The air is discharged from the compression chambers through outlet valves 21 and passageways 22, 23 leading to a storage reservoir 24 fitting into the top of the compressor casing 11 and secured by side fixing set screws. The reservoir is provided with a suitable air outlet valve which also embodies an overload safety relief valve, and at the bottom of the reservoir there is a drain cock through which any water accumulating in the reservoir may be removed. The reservoir has a spigot 30 fitting inside a peripheral flange on the pump casing and is secured by four screws passing through the flange into the spigot.

Mounted on top of the reservoir 24 is an automatic pressure control unit 25 comprising a mercury cut-out switch operable automatically to stop the motor when a pre-determined adjustable pressure has been reached in the reservoir chamber. The unit includes a pressure gauge 26 and a passageway 27 to convey the pressure in the reservoir to the gauge and to a diaphragm for operating the cut-out switch. The electrical connections between the switch and the motor are led through a passageway 28 provided in the reservoir 24.

The unit described above may, as in the previous example be used in conjunction with an additional reservoir chamber and it may be mounted on top of the additional chamber.

It is to be understood that the eccentrics described in the foregoing examples

may be replaced by any mechanical equivalent e.g. a crank-pin or cam.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A diaphragm compressor characterized by the feature that the diaphragm is operated by a rod which is connected at one end to the diaphragm, is constrained for substantially rectilinear movement at that end solely by the diaphragm, is constrained for substantially rectilinear movement at the other end and is reciprocated by a crank-pin, eccentric cam or the equivalent intermediate in the length of the rod.

2. A diaphragm compressor according to Claim 1 in which the aforesaid other end of the rod is guided in a self-aligning guide bearing.

3. A diaphragm compressor according to Claim 1 in which the aforesaid other end of the rod is attached to and effects the operation of, a second diaphragm which constrains the movements of the rod as aforesaid.

4. A diaphragm compressor according to Claim 3 in which the second diaphragm constitutes the operating diaphragm of a second compression chamber.

5. A diaphragm compressor as claimed in any one of the preceding claims in which the weight of the rod is supported 35 by the eccentric.

6. A diaphragm compressor according to any one of the preceding claims in which the crank pin, eccentric or equivalent is positioned on, or near, the axis of 40 the rod and transmits motion to the rod by means of a connecting rod.

7. A diaphragm compressor according to any one of Claims 1 to 4, in which the crank-pin, eccentric or equivalent is positioned on, or near, the axis of the rod and transmits motion to the rod by means of a block surrounding the crank pin or eccentric and rotatable lateral with respect to the rod in guides formed in the rod. 45

8. A diaphragm compressor according to any one of the preceding claims in which the crank-pin, eccentric or equivalent is positioned within a yoke formed in the rod. 50

9. A diaphragm compressor substantially as herein described with reference to the drawings in either one of the foregoing examples. 55

Dated this 5th day of May, 1947.

BOULT, WADE & TENNANT,  
111 & 112, Hatton Garden, London,  
E.C.1.

Chartered Patent Agents.

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